

XP-002320559

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- NLM782872
- Role of growth hormone in improving animal production.
- Pituitary growth hormone (GH) has considerable potential as an anabolic agent in animal production. For example, pigs treated with GH will grow faster (i.e. deposit protein), require less feed per unit of body weight gain, and will have less carcass fat than untreated animals. Lactating cows will produce more milk with less feed. It is likely, though not completely established, that young cattle will also respond to GH treatments. Most of the information on the mode of action of GH has been obtained with laboratory rather than farm animals. The hormone affects almost all aspects of metabolism although the specific mechanism for these effects is still not understood. Stimulation of protein accretion is reflected by increased nitrogen retention and incorporation of radioactive amino-acids into tissue proteins. An increased rate of protein synthesis is thought to be a result of enhanced ability of ribosomes to translate messenger RNA. GH increases polyamine synthesis by increased ornithine decarboxylase activity, RNA synthesis by increasing RNA polymerase and DNA synthesis by increased DNA polymerase. Cell division is stimulated in several tissues (e.g. muscle and lymphoid tissue). In vivo GH lowers the respiratory quotient indicating an increased oxidation of fatty acids. The numbers of fat cells do not change but the fat cells are reduced in size. The stimulating effects of GH on skeletal tissue, and perhaps other tissues as well, is mediated by the formation of at least three peptides called somatomedins. GH is a protein with a molecular weight of about 22,000 and contains 191 amino-acid residues. The amino-acid sequence varies with the species. GH isolated from one species is not always effective in a different species. Use of GH isolated from pituitaries does not appear to be economically feasible. A chemical synthesis for human GH has been accomplished. However, biological activity equivalent to the native hormone has not been unequivocally established. Synthesis of bovine or porcine GH is feasible but will be expensive. A partial sequence of GH with 39 amino-acid residues has some biological activity. Synthesis of this shorter peptide would be considerably less expensive. Since proteins generally are not active orally, an economic procedure for prolonged parenteral administration would have to be devised. Alternative approaches would be the stimulation of endogeneous production of GH with hypothalamic GH releasing factor. This factor has not been identified but is probably a small peptide. Agents such as arginine, DOPA, and prostaglandins, which are known to stimulate GH release under some conditions, could also be considered. Another approach would be the implantation of sparganum from the spirimetra family (a flatworm). This treatment is known to mimic GH effects in the rat. Implantation of a GH producing tumour could also be considered. Clearly these latter suggestions are quite speculative and would present some obvious problems...
- Animals; Animals, Domestic: growth & development(#); Cattle: growth & development; Chemistry; Chickens: growth & development; Female; Growth: drug effects; Growth Hormone: pharmacology(#), secretion; Hypothalamus: drug effects; Male; Pituitary Neoplasms: secretion; Rats; Sheep: growth & development; Somatotropin-Releasing Hormone: pharmacology; Sparganum: physiology; Swine: growth & development; Wool: growth & development
- Growth Hormone; Somatotropin-Releasing Hormone
- Environmental quality and safety. Supplement.
- GERMANY, WEST
- 1976
- Machlin L J
- ISSN 0340-4714
- 5
- 43 - 55
- Journal Article, Review
- IM